WHAT IS CLAIMED IS:

1.

A method for controlling electric conduction on a nanoscale wire, comprising:

providing the nanoscale wire with a first plurality of controllable regions axially distributed along the nanoscale wire, said regions allowing conduction along the nanoscale wire when each region is either controlled with a signal having a value lower than a first threshold or is not controlled; and

either controlling or not controlling said regions, to allow or to prevent electric conduction along the nanoscale wire.

2.

A method for controlling electric conduction on a nanoscale wire, comprising:

providing the nanoscale wire with a first plurality of controllable regions axially distributed along the nanoscale wire, said regions allowing conduction along the nanoscale wire when each region is controlled with a signal having a value higher than a first threshold; and

either controlling or not controlling said regions, to allow or to prevent electric conduction along the nanowire.

3.

The method of claim 1, wherein the nanoscale wire is further provided with a second plurality of controllable regions axially distributed along the nanoscale wire.

4.

The method of claim 2, wherein the nanoscale wire is further provided with a second plurality of controllable regions axially distributed along the nanoscale wire.

5.

The method of claim 3, wherein each region of the second plurality is controllable with a signal having a value lower than a second threshold, the second threshold being higher than the first threshold.

6.

The method of claim 4, wherein each region of the second plurality is controllable with a signal having a value higher than a second threshold, the second threshold being higher than the first threshold.

7.

The method of claim 3 or 4, wherein the conduction along the nanoscale wire is independent of whether the regions of the second plurality are controlled or not.

8.

The method of claim 3 or 4, wherein the regions of the first and second plurality are doped regions.

9.

The method of claim 3 or 4, wherein the regions of the first and second plurality are made of different materials.

10.

The method of claim 3 or 4, wherein controlling or not controlling regions of the first plurality and the second plurality comprises providing a plurality of control wires, each control wire being associated with a distinct region of the nanoscale wire, each control wire being able to carry a controlling signal to control the regions.

11.

The method of claim 10, wherein the control wires are microscale wires.

12.

The method of claim 10, wherein the control wires are nanoscale wires.

13.

The method of claim 10, wherein the controlling signal is generated by an applied voltage.

14.

A method for controlling electric conduction on a plurality of nanoscale wires, comprising:

providing each nanoscale wire with a first plurality of controllable regions axially distributed along the nanoscale wire, said regions allowing conduction along the nanoscale wire when each region is either controlled with a signal having a value lower than a first threshold or is not controlled;

providing a plurality of control wires, each control wire associated with a series of regions of the first plurality-and able to carry a control signal to control the series of regions; and

providing control signals along the control wires to allow conduction on a single nanoscale wire of the plurality of nanoscale wires and to prevent remaining nanoscale wires of the plurality of nanoscale wires from conducting.

15.

A method for controlling electric conduction on a plurality of nanoscale wires, comprising:

providing each nanoscale wire with a first plurality of controllable regions axially distributed along the nanoscale wire, said regions allowing conduction along the nanoscale wire when each region is controlled with a signal having a value higher than a first threshold;

providing a plurality of control wires, each control wire associated with a series of regions of the first plurality and able to carry a control signal to control the series of regions; and

providing control signals along the control wires to allow conduction on a single nanoscale wire of the plurality of nanoscale wires and to prevent remaining nanoscale wires of the plurality of nanoscale wires from conducting.

16.

The method of claim 14, wherein each nanoscale wire is provided with a second plurality of controllable regions axially distributed along the nanoscale wire.

17.
The method of claim 15, wherein the nanoscale wire is further provided with a second plurality of controllable regions axially distributed along the nanoscale wire.

18.
The method of claim 16, wherein each region of the second plurality is controllable with a signal having a value lower than a second threshold, the second threshold being higher than the first threshold.

19.
The method of claim 17, wherein each region of the second plurality is controllable with a signal having a value higher than a second threshold, the second threshold being higher than the first threshold.

20.
The method of claim 16 or 17, wherein the conduction along the nanoscale wire is independent of whether the regions of the second plurality are controlled or not .

21.
The method of claim 16 or 17, wherein the regions of the first and second plurality are doped regions.

22.
The method of claim 16 or 17, wherein the regions of the first and second plurality are made of different materials.

23.
The method of claim 14 or 15, wherein the control wires are microscale wires.

24.

The method of claims 14 or 15, wherein the control wires are nanoscale wires.

25.

The method of claim 14 or 15, wherein the series of regions comprises regions located on different nanoscale wires, one region per nanoscale wire.

26.

The method of claim 14 or 15, wherein the nanoscale wires are substantially parallel to each other and the control wires are substantially parallel to each other.

27.

The method of claim 14 or 15, wherein the plurality of nanoscale wires are packed at sublithographic pitch.

28.

The method of claim 26, wherein the nanoscale wires are substantially orthogonal to the control wires.

29.

The method of claim 14 or 15, further comprising providing an oxide layer between the nanoscale wires and the control wires.

30.

The method of claim 14 or 15, further comprising radially covering the nanoscale wires with oxide.

31.

The method of claim 14 or 15, wherein each nanoscale wire of the plurality of nanoscale wires to be controlled comprises a unique sequence of regions.

32.

The method of claim 14 or 15, wherein each nanoscale wire of the plurality of nanoscale wires to be controlled comprises a uniquely addressable set of sequences of regions.

33.

The method of claim 14 or 15, wherein groups of the nanoscale wires can be independently addressed, the number of groups being a large fraction of the number of nanowires in the array.

34.

The method of claim 14 or 15, wherein the plurality of nanoscale wires to be controlled is stochastically selected by establishing :

a number (C) of different sequences of controllable regions to be provided on the nanoscale wires;

a number (B) of nanoscale wires each having a same sequence of controllable regions, the total number of nanoscale wires among which the plurality of nanoscale wires is to be stochastically selected being C x B; and

a number (N) of nanoscale wires forming the plurality of nanoscale wires to be stochastically selected,

the N nanoscale wires being randomly selected from the C x B nanoscale wires.

35.

The method of claim 34, wherein C is large relative to N^2.

36.

The method of claim 34, wherein C is at least $C = 100 \times N^2$.

37.

The method of claim 34, where C=N.

38.

The method of claim 34, wherein the plurality of nanoscale wires are controlled by control wires, the number of control wires being less than C.

39.

The method of claim 38, wherein the number of control wires is O(log(N)).

40.

The method of claim 34, wherein the number of control wires is $O(\sqrt[k]{N})$ for any desirable k >=1.

41.

A method of addressing nanoscale wires in a plurality of nanoscale wires, comprising:

providing each nanoscale wire with controllable regions axially distributed along the nanoscale wire; and

establishing the plurality of nanoscale wires by stochastically selecting the plurality of nanoscale wires from a larger set of nanoscale wires.

42.

The method of claim 41, further comprising selecting a single nanoscale wire among the plurality of nanoscale wires by either controlling or not controlling the controllable regions on nanoscale wires of the plurality of nanoscale wires, thus uniquely addressing the single nanoscale wire.

43.

The method of claim 41, further comprising selecting none of the nanoscale wires of the plurality of nanoscale wires.

44.

The method of claim 41 or 43, further comprising selecting all the nanoscale wires of the plurality of nanoscale wires.

45.

The method of claim 41, further comprising selecting some of the nanoscale wires of the plurality of nanoscale wires.

46.

The method of claim 14 or 15, wherein misalignment between the control wires and regions on the nanoscale wires associated with the control wires by a distance greater than a width of the control wires is tolerated by repeating a sequence of doped regions along the nanoscale wires.

47.

The method of claim 46 wherein address regions on a nanoscale wire are differentiated from other regions on the nanoscale wire by controlling the voltages used in each region.

48.

The method of claim 14 or 15, wherein misalignment between the control wires and regions on the nanoscale wires associated with the control wires by a distance greater than a width of the control wires is tolerated by manufacturing the regions in accordance with a process comprising the steps of:

masking off an area on the nanoscale wire where the regions will be; and

bulk doping the remaining area in the nanoscale wires.

49.

The method of claim 14 or 15, wherein misalignment between the control wires and regions on the nanoscale wires associated with the control wires by a distance greater than a width of the microscale wires is tolerated by repeating a portion of a sequence of doped regions along the nanoscale wires.

50.

The method of claim 49, wherein the repeated portion has an extension depending on an extension of a predetermined alignment guard region.

51.

The method of claim 14 or 15, wherein misalignment between the control wires and regions on the nanoscale wires associated with the control wires by a distance less than a width of the microscale wires is tolerated by designing length or profile of the controllable regions.

52.

An arrangement comprising:

a nanoscale wire having a first plurality of controllable regions axially distributed along the nanoscale wire, said regions allowing conduction along the nanoscale wire when each region is either controlled with a signal having a value lower than a first threshold or is not controlled; and

means for controlling electric conduction along the nanoscale wire.

53.

An arrangement comprising:

a nanoscale wire having a first plurality of controllable regions axially distributed along the nanoscale wire, said regions allowing conduction along the nanoscale wire when each region of the first set is controlled with a signal having a value higher than a first threshold; and

means for controlling electric conduction along the nanoscale wire.

54.

The arrangement of claim 52, wherein the nanoscale wire further has a second plurality of controllable regions axially distributed along the nanoscale wire.

55.

The arrangement of claim 53, wherein the nanoscale wire further has a second plurality of controllable regions axially distributed along the nanoscale wire.

56.

The arrangement of claim 54 or 55, wherein the regions of the first and second plurality are doped regions.

57.

The arrangement of claim 54 or 55, wherein the regions of the first and second plurality are made of different materials.

58.

The arrangement of claim 52 or 53, wherein said means for controlling comprise a plurality of control wires, each control wire associated with a distinct region of the nanoscale wire, each control wire being able to carry a controlling signal to control the regions.

59.

The arrangement of claim 58, wherein the control wires are selected from a group comprising microscale wires or nanoscale wires.

60.

A device comprising:

a plurality of nanoscale wires, each nanoscale wire comprising a first set of controllable regions axially distributed along the nanoscale wire, said controllable regions allowing conduction along the nanoscale wire when each region is either controlled with a signal having a value lower than a first threshold or is not controlled; and

a plurality of control wires, each control wire associated with a series of controllable regions and able to carry a control signal to control the series of controllable regions.

61.

A device comprising:

a plurality of nanoscale wires, each nanoscale wire comprising a first set of controllable regions axially distributed along the nanoscale wire, said controllable regions allowing conduction along the nanoscale wire when each region is controlled with a signal having a value higher than a first threshold; and

a plurality of control wires, each control wire associated with a series of controllable regions and able to carry a control signal to control the series of controllable regions.

62.

The device of claim 60 or 61, wherein each nanoscale wire further comprises a second set of controllable regions axially distributed along the nanoscale wire.

63.

The device of claim 62, wherein the controllable regions of the first and second set are doped regions.

64.

The device of claim 62, wherein the controllable regions of the first and second set are made of different materials.

65.

The device of claim 60 or 61, wherein the control wires are selected from a group comprising microscale wires or nanoscale wires.

66.

The device of claim 60 or 61, wherein the nanoscale wires are substantially parallel to each other and the control wires are substantially parallel to each other.

67.

The device of claim 66, wherein the nanoscale wires are substantially orthogonal to the control wires.

68.

The device of claim 60 or 61, further comprising an oxide layer between the nanoscale wires and the control wires.

69.

The device of claim 60 or 61, wherein the nanoscale wires are radially covered with oxide.

70.

The device of claim 60 or 61, wherein each nanoscale wire comprises a unique sequence of regions.

71.

An apparatus for uniquely addressing a single nanoscale wire in a plurality of nanoscale wires, comprising:

means for providing each nanoscale wire with controllable regions axially distributed along the nanoscale wire;

means for establishing a subset of nanoscale wires to be controlled by stochastically selecting the subset from the plurality of nanoscale wires; and

means for selecting the single nanoscale wire among the subset of nanoscale wires by either controlling or not controlling the controllable regions on nanoscale wires of the subset of nanoscale wires.